DOCUMENT RESUME

ED 310 919 SE 050 857

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TITLE Effects of Computer Assisted Instruction on Mathematics and Locus of Control.
PUB DATE 87
NOTE 19p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *College Mathematics; *Computer Assisted Instruction; Computer Uses in Education; Higher Education; *Locus of Control; Mathematical Enrichment; Mathematics Achievement; *Mathematics Instruction; Mathematics Skills; Mathematics Teachers; *Minority Groups; Preservice Teacher Education; *Teacher Qualifications; Teacher Recruitment

ABSTRACT

South Carolina requires that prospective teachers pass an Education Entrance Examination (EEE) consisting of three parts--writing, reading, and mathematics. Minorities are having difficulty passing the mathematics portion of this test. This study investigated the effects of computer-assisted instruction (CAI) on basic skills mathematics achievement and locus of control of minority students seeking admission to teacher education programs. A pretest/posttest experimental group design was used. Forty-nine EEE mathematics seminar students (all were blacks except one) were randomly assigned to an experimental group and a control group. The seminar was continued for six weeks (18 sessions). The primary difference between the two groups was that the experimental group received 30 minutes of CAI in mathematics during each session. The results of statistical analysis showed that the CAI increased the students' mathematics scores and that they developed a more internal orientation through its use. (YP)

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ED310919

EFFECTS OF COMPUTER ASSISTED INSTRUCTION ON MATHEMATICS AND LOCUS OF CONTROL

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Abstract

This study investigated the effects of computer assisted instruction on basic skills mathematics achievement, and locus of control of minority students seeking admission to teacher education programs. A pretest/posttest experimental group design was used. CAI increased the mathematics scores and resulted in a more internal orientation.

Introduction

Education Entrance Examination

Some states are requiring prospective teachers to pass a basic skills test in reading, mathematics and writing as standard practice for admission to approved teacher education programs. Minorities tend to score low on standardized tests especially in basic skills mathematics. Therefore, future teachers from these groups could become extinct unless programs are implemented to assist the prospective educators in passing the mathematics basic skills test.

South Carolina requires that prospective teachers pass the EEE (Education Entrance Examination). To pass the EEE, examinees must pass all three portions. They may take the EEE no more than three times. The areas assessed are writing, reading and mathematics. The mathematics portion consists of 56 multiple-choice questions that measure performance in the domains of arithmetical concepts and operations, measurements, geometry and problem solving.

Minorities throughout the state of South Carolina are having difficulty passing the basic skills mathematics portion of the EEE. The passing rate on the writing and reading EEE is much higher than the math.

Seminars have been instituted at South Carolina State College to prepare the students for this examination. This study is designed to assess the effectiveness of supplementing the mathematics seminar with a highly rated mathematics computer assisted instruction (CAI) program in increasing the basic skills mathematics and locus of control scores of the students.

Computer Assisted Instruction

There have been rapid advances in computer technology in the past 20 years. Education has been a beneficiary of these advancements with regard to CAI. Can CAI offer students advantages for learning that teachers or textbooks cannot? Although opinions regarding this issue might differ, strong consideration must be given to computer assisted instructions' powerful and varied capabilities for instructional adaptation.

There is cumulative evidence that computers seem to provide an effective means of improving performance in mathematics. Reviews in which CAI is summarized (Rapoport and Savard, 1980) have all shown consistent positive effects on both achievement and attitudes. A growing number of the reviews relate to teaching

mathematics to disadvantged students (Lanese, 1983).

Bradtmueller (1983) summarized what is currently known about the positive and negative effects concerning CAI. Covering the period from 1975 to 1983, Bradtmueller indicated the following pros of using microcomputers. Advantages of using microcomputers include the following:

1. highly motivating and encouraging,
2. helps prepare students for a computer world,
3. fosters independent study,
4. gives immediate feedback to students,
5. encourages individualization, and
6. nonthreatening.

Burns and Bozeman (1981) found that CAI drill and practice were more effective in promoting student achievement at both elementary and secondary instructional levels among students who were considered to be high achieving and disadvantaged. They found that achievement among average students was not significantly improved by supplementary enhanced drill and practice CAI.

In the affective domain, Weller (1983) described the computer as being private, patient, unangered, and

bias-free, thus providing an excellent vehicle for students to examine their own value systems without detriment to their self-concepts. Cox and Berger (1981) found that students who use microcomputers show positive growth in their attitudes toward school work, self-control, and tasks which involve problem solving skills. They believed that computers foster positive development of students' self-concepts and promote growth through a sequence of nonthreatening challenges. Gallini (1983) suggested that CAI encourages a constant environment to motivate students toward more creativity, an opportunity seldom available in traditional methods. Basically, CAI is a learning structure that is interactive and individualized. Lesgold (1983) credited the computer's strength to being able to diagnose sources of student errors rapidly and assess progress in their acquisition of skills.

The literature relating computer assisted instruction to mathematics performance leads to the conclusion that a positive relationship exists. Also, it seems that CAI is beneficial to some ethnic groups over others and that the degree of impact computers have on education in many areas of instruction is only beginning to be studied systematically. The literature

on CAI seems to suggest that a CAI supplemented EEE Seminar should increase mathematics scores.

Locus of Control

Another dependent variable this study is locus of control. Many students were fearful of the mathematics EEE and decided against trying to obtain admission in a teacher education program and would seek out majors in Business, Psychology, etc. However, it is the responsibility of educators to develop individuals who believe that they control their own destinies, at least to some degree (Phares, 1976). Rotter conceptualized this belief and developed a theory of internal-external locus of control reinforcement. He defined locus of control as a person's perception of the degree to which the reward follows from, or is contingent upon, his or her own behavior or attributes versus the degree to which he or she feels the reward is controlled by forces outside of himself or herself and may occur independently of his or her own actions (Rotter, 1966).

Also, of importance to the individual and to the school is the finding that not only do internals more actively seek to control their environments, they also more actively seek to control themselves. Stephens

(1976) examined the effects of two classroom techniques and their impact on locus of control. He found significant differences in locus of control scores and concluded that classroom experiences can have systematic effects on locus of control scores. It may be that a particular EEE seminar student who works on a computer may perceive himself or herself differently in the computer situation as a result of that computer interaction.

Ayabe and Nitahara-Pang (1981) were able to actually modify locus of control scores of college students through two half-hour sessions in mnemonic training. Those students given the treatment had more internal scores than those who did not. This suggests the potential for affecting locus of control via the manipulation of teaching/learning strategies over a short period of time. Providing prospective teacher educators a greater degree of internal control might deter them from seeking out other majors due to their apprehension in passing the mathematics EEE.

Purpose of Study

The purpose of this study is to evaluate the effects of the computer assisted remediation program on

basic skills mathematics achievement and locus of control of students in an EEE seminar at a predominantly black institution in a rural setting.

Research Questions

Answers to the following research questions were sought:

1. Are the adjusted posttest scores of the EEE seminar students in basic skills mathematics significantly affected ($p < .05$) by (a) type of instruction (CAI vs. non-CAI), (b) sex (male vs. female), and (c) interaction of mode of instruction and sex?
2. Are the adjusted posttest scores of the EEE seminar students in locus of control significantly affected ($p < .05$) by (a) type of instruction (CAI vs. non-CAI), (b) sex (male vs. female), and (c) interaction of mode of instruction and sex?

Methodology

This study is an extension of a research paper presented at the Eastern Educational Research Association in February 1989. Subjects for this study

consisted of EEE seminar students at South Carolina State College in Orangeburg, South Carolina. A random assignment of students using the CRC Handbook of Tables for Probability and Statistics (Beyer, 1987) was made. As determined from demographic information, black males comprised 43.0% (21) of the subjects, black females constituted 47.0% (27) of the total group of subjects.

The research design used was the pretest-posttest experimental group design. The dependent variables studied were basic skills mathematics and locus of control scores. The independent variables studied were type of instruction and sex.

Forty-nine EEE mathematics seminar students were randomly assigned to an experimental group and a control group. The students were given two pretests: A Basic Skills Mathematics EEE pretest and the Nowicki-Strickland Personal Reaction Survey (Nowicki and Strickland, 1972). Following administration of the instruments, the students in the control group participated in six weeks (18 sessions), 60 minutes per session, of EEE mathematics instruction. The students in the experimental group participated in six weeks (18 sessions) of CAI plus EEE seminar instruction in mathematics. Thirty minutes were CAI instruction in

mathematics and thirty minutes were EEE seminar instruction in mathematics. The primary difference between the groups was that the experimental group received 30 minutes each session of CAI in mathematics. Upon termination of the six weeks instructional period, students received posttests on measures of basic mathematics and locus of control.

The statistical technique used to analyze the data was analysis of variance (ANOVA). Posttest scores were analyzed for differences in type of instruction, sex, and the interaction between sex and type of instruction. The Statistical Program for the Social Sciences version (SPSSX) was used to calculate the ANOVA.

Findings

Answers to two questions were sought. This section contains the results of statistical analysis of data obtained in regard to the two questions.

Question 1

1. Are the posttest scores of the EEE seminar students in basic skills mathematics significantly affected ($p < .05$) by (a) type of instruction (CAI vs. non-CAI), (b) sex (male vs. female), and (c) interaction of mode of

instruction and sex?

The mathematics scores were analyzed for differences with regards to type of instruction, sex, and the interaction between sex and type of instruction. There were statistically significant differences in adjusted posttest basic skills mathematics scores with regard to type of instruction (F = 13.58, p = 0.001). There were no statistically significant differences in basic skills mathematics scores with regard to sex (F = 1.63, p = 0.21), and the interaction between sex and type of instruction (F = 2.18, p = 0.15). The findings indicate that the mathematics scores were significantly increased by the CAI but was not affected by the sex of the student.

Insert Table 1 About Here

Question 2

2. Are the posttest scores of the EEE seminar students in locus of control significantly affected ($p < .05$) by (a) type of instruction (CAI vs. non-CAI), (b) sex (male vs. female), and (c) interaction of mode of instruction and sex?

There was a statistically significant difference in locus of control scores with regard to type of instruction ($F = 5.96$, $p = .05$). There were no statistically significant differences with regard to sex ($F = .18$, $p = .67$), and the interaction between sex and type of instruction ($F = .31$, $p = .58$). The CAI significantly increased the locus of control scores of the students.

Insert Table 2 About Here

Discussion

Students come into the EEE mathematics seminar with subpar mathematical skills and an external locus of control orientation. CAI can positively change these cognitive and effective variables because it is motivating, encouraging and provides a nonthreatening environment. CAI fosters reliance on inner motivation and evaluation as opposed to dependence and praise from others. With the increasing enrollment of minority students in EEE mathematics seminars this article has importance for educators. Remediation programs with CAI appear to give the students a sense of control over their educational environment. The end result could be an increase in the number of students gaining admission to teacher education programs that require a basic skills mathematics test as one of the entry requirements.

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REFERENCES

Ayabe, H.L., and Nitahara-Pang, C. (1981). Modifying locus of control scores through mnemonic training. Journal of General Psychology, 105, 269-271.

Beyer, W. H. (Ed.). (1987). CRC Handbook of Table for Probability and Statistics ed.). Boca Raton, FL: CRC Press Inc.

Bradtmueller, W. G. (1983). Perception of the use of high technology in the teaching of reading: Microcomputer use in teaching reading. Washington, DC: National Institute of Education. (ERIC Document Reproduction Service No. ED 230 979).

Burns, P., and Bozeman, W. (1981). Computer assisted instruction and mathematics achievement: Is there a relationship? Educational Technology, 21(10), 32-39.

Cox, D., and Berger, C. (1981). Microcomputers. Science and Children, 19, 1-4.

Gallini, J. (1983). What CAI can offer toward the encouragement of creative thinking? Educational Technology, 23(3), 40-43.

Lanese, J. (1983). Computer assisted instruction in mathematics. Cleveland: Cleveland Public Schools. (ERIC Document Reproduction Service No. ED 236 295).

Lesgold, A. (1983). When can computers make a difference? Theory into Practice, 22, 247-252.

Norwicki, S., and Strickland, B. R. (1972). A locus of scale for children. Journal of Consulting and Clinical Psychology, 40, 148-154.

Phares, E. J. (Ed.). (1976). Locus of control in personality. Morristown, NJ: General Learning Press.

Rapoport, P., and Savard, W.G. (1980). Computer assisted instruction topic summary report. Juneau, AK: Northwest Regional Education Laboratory. (ERIC Document Reproduction Service No. ED 217 893).

Rotter, J.B. (1966). Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs: General and Applied, 80, 1-28.

Stephens, M. W. (1976). Internal/external orientation. In E.J. Phares (Ed.), Locus of control in personality (pp. 62-85). Morristown, NJ: General Learning Press.

Weller, N. M. (1983). Microcomputer learning in small groups: Cognitive requirements and group processes. Educational Psychology, 76, 1076-1088.

Table 1

Analysis of Variance of Measures of Basic Skills Mathematics

Dependent Variable: Mathematics Scores

Source of Variation	DF	SS[a]	MS[b]	F Value	Sig. of F
Main Effects	2	1189.07	594.54	7.61	0.001
Group	1	1061.40	1061.40	13.58	0.001
Sex	1	127.68	127.68	1.63	0.21
Group x Sex	1	170.24	170.24	2.18	0.15

[a]SS is Sum of Squares and [b]MS is Mean Square

Table 2

Analysis of Variance for Measures of Locus of Control

Dependent Variable: Locus of Control Scores

Source of Variation	DF	SS[a]	MS[b]	F Value	Sig. of F
Main Effects	2	121.23	60.61	3.07	0.03
Group	1	117.63	117.63	5.96	0.02
Sex	1	3.40	3.40	0.18	0.67
Group x Sex	1	6.13	6.13	0.31	0.58

[a] SS is Sum of Squares and [b] MS is Mean Square